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EXAMINER	
LEUNG, JENNIFER A	
ART UNIT	**PAPER NUMBER**
1764	

DATE MAILED: 11/23/2005

Please find below and/or attached an Office communication concerning this application or proceeding.

Office Action Summary	Application No.	Applicant(s)	
	10/807,851	JIANG ET AL.	
	Examiner	Art Unit	
	Jennifer A. Leung	1764	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

1)☒ Responsive to communication(s) filed on *11 October 2005*.

2a)☐ This action is **FINAL**. 2b)☒ This action is non-final.

3)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

4)☒ Claim(s) *19-33,35-46 and 48-69* is/are pending in the application.

4a) Of the above claim(s) _____ is/are withdrawn from consideration.

5)☐ Claim(s) _____ is/are allowed.

6)☒ Claim(s) *19-33,35-46 and 48-69* is/are rejected.

7)☐ Claim(s) _____ is/are objected to.

8)☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

9)☒ The specification is objected to by the Examiner.

10)☒ The drawing(s) filed on *24 March 2004* is/are: a)☐ accepted or b)☒ objected to by the Examiner.

Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).

11)☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

12)☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

a)☐ All b)☐ Some * c)☐ None of:

1.☐ Certified copies of the priority documents have been received.

2.☐ Certified copies of the priority documents have been received in Application No. _____.

3.☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

1) ☒ Notice of References Cited (PTO-892)
2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
3) ☒ Information Disclosure Statement(s) (PTO-1449 or PTO/SB/08) Paper No(s)/Mail Date *3-30-05;4-13-04;*10/21/05.
4) ☐ Interview Summary (PTO-413) Paper No(s)/Mail Date. _____ .
5) ☐ Notice of Informal Patent Application (PTO-152)
6) ☐ Other: _____.

DETAILED ACTION

Election/Restrictions

1. Applicant's election without traverse of Group II, claims 19-46 and 48-50 in the reply filed on October 11, 2005 is acknowledged. Claims 1-18 and 47 are withdrawn from further consideration pursuant to 37 CFR 1.142(b) as being drawn to a nonelected invention, there being no allowable generic or linking claim. Claims 1-18, 34 and 47 are cancelled. Claims 51-69 are newly added. Claims 19-33, 35-46 and 48-69 remain active.

Specification and Drawings

2. The description of Figure 10 in section [0030] contradicts what is shown in the figure. Section [0030] identifies reference **510** as a permeable wall and reference **520** as a parallel zone. However, reference **510** points to a parallel zone and reference **520** points to a permeable wall.

3. The description of Figures 2a and 2b in section [0021] contradicts. Lines 3-5 recite,

> "*Figures 2a and 2b* show a velocity profile, represented by lines 45, in a gas agitated reactor *respectively with and without internal structures*."
>
> Lines 8-9, however, recite,
>
> "The *internal structures* tend to flatten the velocity profile (*Figure 2b*) by reducing the degree of backmixing."

It is unclear as to which figure represents the reactor with internal structures. It is further suggested to insert the heading --With Internal Structures-- or --Without Internal Structures-- under the correct drawing of Figures 2a and 2b for clarification.

4. Corrected drawing sheets in compliance with 37 CFR 1.121(d), or amendment to the specification to add the reference character(s) in the description in compliance with 37 CFR

1.121(b) are required in reply to the Office action to avoid abandonment of the application. Any amended replacement drawing sheet should include all of the figures appearing on the immediate prior version of the sheet, even if only one figure is being amended. Each drawing sheet submitted after the filing date of an application must be labeled in the top margin as either "Replacement Sheet" or "New Sheet" pursuant to 37 CFR 1.121(d). If the changes are not accepted by the examiner, the applicant will be notified and informed of any required corrective action in the next Office action. The objection to the drawings will not be held in abeyance.

Claim Rejections - 35 USC § 112

The following is a quotation of the second paragraph of 35 U.S.C. 112:

> The specification shall conclude with one or more claims particularly pointing out and distinctly claiming the subject matter which the applicant regards as his invention.

5. Claims 19-33, 35-46 and 48-69 are rejected under 35 U.S.C. 112, second paragraph, as being indefinite for failing to particularly point out and distinctly claim the subject matter which applicant regards as the invention.

Regarding claim 19, a "low degree of backmixing" (line 1) is considered vague and indefinite because "low" is a relative term. Furthermore, it is unclear as to the whether applicant is attempting to positively claim a liquid, disposed within the reaction vessel, by the recitation, "said reaction vessel configured to having a liquid disposed therein" (line 4).

Regarding claim 45, it is unclear as to the structural limitation applicant is attempting to recite by, "the gas-agitated multi-phase reactor is a hydrocarbon synthesis reactor" because the use of the reactor as a "gas synthesis reactor" constitutes an intended use recitation that provides no further patentable weight to the claim.

Regarding claim 46, it is unclear as to the structural limitation applicant is attempting to

recite by, "the gas-agitated multi-phase reactor is a slurry bubble column" because the use of the reactor as a "slurry bubble column" constitutes an intended use recitation that provides no further patentable weight to the claim.

Regarding claim 48, a "large diameter reaction vessel" (line 2) is considered vague and indefinite because "large" is a relative term.

Regarding claim 68, it is unclear as to the structural limitation applicant is attempting to recite by, "the gas flow has a gas linear velocity of about 12 cm/s to about 50 cm/s" because the "gas flow" is not an element of the apparatus and its corresponding "gas linear velocity" is considered a process limitation.

Regarding claim 69, it is unclear as to the structural limitation applicant is attempting to recite by, "the plurality of internal structures inside the reaction vessel are arranged such that hydrodynamic in each reaction zone approach the hydrodynamics in a column with...." in lines 1-5, because it is unclear as to what configuration of the internal structures enables a reaction conducted within the apparatus to exhibit the claimed hydrodynamic characteristics.

Claim Rejections - 35 USC § 102

The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

> A person shall be entitled to a patent unless –
>
> (b) the invention was patented or described in a printed publication in this or a foreign country or in public use or on sale in this country, more than one year prior to the date of application for patent in the United States.

6. Claim 48 is rejected under 35 U.S.C. 102(b) as being anticipated by Chen et al. ("Fluid dynamic parameters in bubble columns with internals." *Chemical Engineering Science* 54 (1999) 2187-2197).

Chen et al. (FIG. 1, FIG. 2, section 2.1; page 2188) discloses an apparatus comprising: a large diameter reaction vessel capable of having a liquid contained therein (i.e., a column made of Plexiglas with a diameter of 19 in., or an inner diameter of 44 cm.); a means for introducing gas into the reaction vessel (i.e., a distributor comprising a perforated plate; see FIG. 1); and a means for reducing the liquid axial dispersion coefficient and backmixing within the reaction vessel (i.e., internals composed of two bundles of 1" aluminum tubes located at two different radial positions, see FIG. 2).

Instant claim 48 structurally reads on the apparatus of Chen et al.

7. Claims 19-23, 27, 29, 31, 40, 42, 45, 46, 48, 50, 65, 68 and 69 are rejected under 35 U.S.C. 102(b) as being anticipated by Hagino et al. (US 4,327,042).

Regarding claims 19 and 23, Hagino et al. (FIG. 1-3; column 2, line 23 to column 4, line 44) discloses an apparatus comprising: a reaction vessel with an internal diameter Dr greater than or equal to 0.6 meter (i.e., column **1**, with a diameter of 80 cm; see Example 1); a gas distributor (i.e., aeration pipe **3**) disposed near the bottom of the reaction vessel **1**; and a plurality of internal structures (i.e., plates **2**) disposed within the reaction vessel **1**, wherein the structures **2** are arranged so as to create a plurality of reaction zones in the reaction vessel **1** (i.e., a first zone within the cylinder defined by plates **2**, and a second zone in the annular space between plates **2** and the wall of column **1**; also, plural zones from one or more units disposed one above another; see column 2, line 68 to column 3, line 2), wherein each reaction zone is in fluid communication with at least one adjacent reaction zone (i.e., via the space between overlapping plates **2**); and wherein the plurality of internal structures is configured such that each of the reaction zones has a characteristic size Ds that is less than the reaction vessel internal diameter Dr (see FIG. 2).

Regarding claims 20 and 21, Hagino et al. discloses a patterned arrangement of the internal structures **2** creates a circular/concentric circular reaction zone (see FIG. 2).

Regarding claim 22, Hagino et al. discloses that the structures may be "in the form of one or more units disposed one above another," (column 2, line 68 to column 3, line 2). Thus, the structure **2** may be arranged in various patterns to create repeating zones.

Regarding claim 27, the diameter of the apparent circle of the plates **2** is generally 0.65 to 0.75 that of the diameter of the column **1** (see FIG. 2; column 2, lines 51-54). Thus, for a column **1** having a diameter of 80 cm, the characteristic size Ds is about .52 to .60 meters.

Regarding claim 29, the reaction vessel 1 has a height to diameter ratio between about 0.5 and about 20 (i.e., a height of 4 m and a diameter of 80 cm, for a ratio of 5; see Example 1).

Regarding claim 31, the internal structures **2** have a characteristic size d (i.e., each plate is 3 m x 50 cm), wherein d is smaller than Ds (i.e., d = 50 cm; Ds = 56 cm). (see Example 1).

Regarding claim 40, Hagino et al. discloses that the structures may be "in the form of one or more units disposed one above another," (column 2, line 68 to column 3, line 2). Thus, the internal structures may be parallel so as to create repeating parallel reaction zones.

Regarding claim 42, Hagino et al. discloses that the structures **2** may comprise circular, rectangular or irregular cross-sectional shapes (see column 2, lines 41-67).

Regarding claim 45 and 46, the apparatus of Hagino et al. structurally meets the claims because the use of the apparatus as a "hydrocarbon synthesis reactor" or a "slurry bubble column" is considered an intended use that provides no further patentable weight to the claims.

Regarding claims 48 and 50, Hagino et al. (FIG. 1-3; column 2, line 23 to column 4, line 44) discloses an apparatus comprising: a large diameter reaction vessel capable of having a liquid

contained therein (i.e., column **1**, with a diameter of 80 cm; see Example 1); a means (i.e., aeration pipe **3**) for introducing gas into the reaction vessel; and a means (i.e., plates **2**) for reducing the liquid axial dispersion coefficient and backmixing within the reaction vessel.

Regarding claim 65, Hagino et al. discloses that the structures may be "in the form of one or more units disposed one above another," (column 2, line 68 to column 3, line 2). Thus, the internal structures may comprise plural, or at least 2, distinct circular reaction zones.

Regarding claim 68, the apparatus of Hagino et al. structurally meets the claims because the gas flow linear velocity is considered a process limitation that provides no further patentable weight to the apparatus claim.

Regarding claim 69, the apparatus of Hagino et al. structurally meets the claims; therefore, as best understood, a reaction conducted within the apparatus of Hagino et al. would inherently exhibit the recited hydrodynamic behavior (see column 3, lines 3-45).

Instant claims 19-23, 27, 29, 31, 40, 42, 45, 46, 48, 50, 65, 68 and 69 structurally read on the apparatus of Hagino et al.

8. Claims 19-25, 29-31, 40-43, 45-50, 53, 54, 57, 58 and 65-69 are rejected under 35 U.S.C. 102(b) as being anticipated by Kolbel et al. (US 2,853,369).

Regarding claims 19 and 23-25, Kolbel et al. (FIG. 7a, 7b; column 4, line 67 to column 5, line 16) discloses an apparatus comprising: a reaction vessel (i.e., reactor **1**; FIG. 7a) with an internal diameter Dr greater than or equal to 0.6 meter (i.e., the reactor comprises "a vertical cylinder having a horizontal diameter of more than 30 cm. and up to 3 m. or more," column 3, lines 43-52); a gas distributor (i.e., a central gas inlet **2**, FIG. 7a; see also FIG. 10a, 10b, 10c, 11) disposed near the bottom of the reaction vessel **1**; and a plurality of internal structures (i.e., shafts

4 and a heat exchanger pipe system **7**) disposed within the reaction vessel **1**, wherein the structures **4,7** are arranged so as to create a plurality of reaction zones in the reaction vessel **1** (i.e., in the spaces between elements **4** and **7**); wherein each reaction zone is in fluid communication with at least one adjacent reaction zone; and wherein the plurality of internal structures **4,7** is configured such that each of the reaction zones has a characteristic size Ds that is less than the reaction vessel internal diameter Dr (see FIG. 7b; also see FIG. 8, 9 and 4-6).

Regarding claim 20, the plurality of reaction zones is created by a patterned arrangement of internal structures **4**, **7** (see FIG. 7a, 7b; also see FIG. 8, 9 and 4-6, wherein structure **4** is represented by **a** and structure **7** is represented by **b**).

Regarding claim 21, the patterned arrangement of structures **4,7** may create a cross sectional shape of the reaction zones that is circular, rectangular, concentric circular, and combinations thereof (see FIG. 7b, 8, 9; also see FIG. 4-6; the structure **4** is designated as reference character **a**, and the structure **7** is designated as reference character **b**).

Regarding claim 22, the structures **4** and **7** are arranged in various patterns to create repeating zones (see FIG. 7b, 8, 9; also see FIG. 4-6; the structure **4** is designated as reference character **a**, and the structure **7** is designated as reference character **b**).

Regarding claim 29, Kolbel discloses that the reaction vessel comprises, "... a vertical cylinder having a horizontal diameter of more than 30 cm. and up to 3 m. or more, and more than 1.5 m. in height, which height above the gas inlet is at least as great as the diameter of the oven." (column 3, lines 43-58). Taking a horizontal diameter of 31 cm. and a height of 1.6 m. as a sample calculation, the height to diameter ratio of the reaction vessel is about 5.

Regarding claim 30, the reaction zones may have a height to diameter ratio between

about 7 and about 180 (i.e., "[t]he ratio of the height to the diameter of the shafts [**4**] can be between 10 and 200, preferably between 20 and 100," column 4, lines 38-40).

Regarding claim 31, internal structures **4** and **7** have a characteristic size *d* (i.e., representing the thickness of an internal structure **4** or a diameter of internal structure **7**) that is smaller than *Ds* (i.e., representing each zone between structures **4** and 7). (see FIG. 7b, 8, 9, 4-6).

Regarding claim 40, the internal structures **4** and **7** are parallel so as to create repeating parallel reaction zones (see FIG. 7a, 7b; also see FIG. 8, 9 and 4-6).

Regarding claims 41 and 42, structures **4** and **7** include tubes or rods having a circular cross-sectional shape (see FIG. 7a, 7b, 8, 9, 4-6).

Regarding claim 43, the internal structures **4** and **7** include heating or cooling tubes (i.e., structures 7 are heat exchange tubes).

Regarding claims 45 and 46, the apparatus of Kolbel et al. structurally meets the claims because the use of the apparatus as a "hydrocarbon synthesis reactor" or a "slurry bubble column" is considered an intended use that provides no further patentable weight to the claims.

Regarding claim 48, Kolbel et al. (FIG. 7a, 7b; column 4, line 67 to column 5, line 16) discloses an apparatus comprising: a large diameter reaction vessel **1** capable of having a liquid contained therein; a means **2** for introducing gas into the reaction vessel **1**; and a means for reducing the liquid axial dispersion coefficient and backmixing within the reaction vessel (i.e., a plurality of shafts **4**; a plurality of heat exchange pipes **7**).

Regarding claim 49, means **4** and **7** comprise a non-uniform distribution of internal structures (i.e., as defined by Applicants in section [0025], a distribution is non-uniform if, when dividing the reaction vessel into zones of 5% to 20% of the total area, the formed zones do not

comprise identical configurations and/or area of internal structures. See FIG. 7b, 8, 9 and 4-6, wherein arbitrarily drawn zones of 5% to 20% of the total area meet this definition).

Regarding claim 50, the reaction vessel **1** has an internal diameter *Dr* greater than or equal to 0.6 meter (i.e., the reactor comprises "a vertical cylinder having a horizontal diameter of more than 30 cm. and up to 3 m. or more," column 3, lines 43-52).

Regarding claim 53, the internal structures **4** and **7** are arranged in various patterns to create reaction zones within the reaction vessel **1** (see FIG. 7b, 8, 9, 4-6), wherein each reaction zone is in fluid communication with at least one adjacent reaction zone (e.g., via the spaces between each of the structures **4** and **7**).

Regarding claim 54, the reaction vessel **1** has an internal diameter *Dr*, and each of the reaction zones (i.e., as defined by the spaces between structures **4** and **7**) has a characteristic size Ds, wherein Ds is less than Dr (see FIG. 7b; also see FIG. 8, 9 and 4-6).

Regarding claim 55, the internal structures **4** and **7** are parallel so as to create parallel reaction zones within the reaction vessel (see FIG. 7a, 7b, 8, 9, 4-6).

Regarding claim 56, the internal structures **4** and **7** are arranged in various patterns to create repeating reaction zones within the reaction vessel (see FIG. 7a, 7b, 8, 9, 4-6).

Regarding claim 57, the internal structures **4** and 7 are part of a cooling coil (i.e., structure **7** is part of a heat exchange pipe system) comprising a continuous set of vertical tubes connected by a connection means (see FIG. 7a).

Regarding claim 58, structures **4** and **7** are part of one or more coils comprising a continuous set of vertical components connected by a connection means (i.e., structure **7** is a heat exchange pipe system; see FIG. 7a).

Regarding claims 62 and 63, means **4** and **7** comprise a non-uniform distribution of internal structures (i.e., as defined by Applicants in section [0025], a distribution is non-uniform if, when dividing the reaction vessel into zones of 5% to 20% of the total area, the formed zones do not comprise identical configurations and/or area of internal structures. See FIG. 7b, 8, 9 and 4-6, wherein arbitrarily drawn zones of 5% to 20% of the total area meet this definition).

Regarding claims 65 and 66, the reaction vessel **1** may comprise at least 2, and furthermore, at least 4, distinct circular reaction zones (i.e., see FIG. 4, 5 and 6, wherein each reaction zone defined by a respective shaft **4** is designated by reference character **a**).

Regarding claim 67, the plurality of internal structures 4 and 7 comprises active structures (i.e., a catalyst suspension).

Regarding claim 68, the apparatus of Kolbel et al. structurally meets the claims because the gas flow linear velocity is considered a process limitation that provides no further patentable weight to the apparatus claim.

Regarding claim 69, the apparatus of Kolbel et al. structurally meets the claims; therefore, as best understood, a reaction conducted within the apparatus of Kolbel et al. would inherently exhibit the recited hydrodynamic behavior.

Instant claims 19-25, 29-31, 40-43, 45-50, 53, 54, 57, 58 and 65-69 structurally read on the apparatus of Kolbel et al.

Claim Rejections - 35 USC § 103

The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

> (a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are

> such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negatived by the manner in which the invention was made.

This application currently names joint inventors. In considering patentability of the claims under 35 U.S.C. 103(a), the examiner presumes that the subject matter of the various claims was commonly owned at the time any inventions covered therein were made absent any evidence to the contrary. Applicant is advised of the obligation under 37 CFR 1.56 to point out the inventor and invention dates of each claim that was not commonly owned at the time a later invention was made in order for the examiner to consider the applicability of 35 U.S.C. 103(c) and potential 35 U.S.C. 102(e), (f) or (g) prior art under 35 U.S.C. 103(a).

9. Claims 26-28, 32, 33, 35, 36, 51, 52, 59-61 and 64 are rejected under 35 U.S.C. 103(a) as being unpatentable over Kolbel et al. (US 2,853,369).

Regarding claim 26, Kolbel et al. discloses that the reaction vessel comprises, "a vertical cylinder having a horizontal diameter of more than 30 cm. and up to 3 m. or more," (column 3, lines 43-58). Kolbel, however, is silent as to the horizontal diameter *Dr* being, specifically, greater than or equal to 10 m. In any event, it would have been obvious for one of ordinary skill in the art at the time the invention was made to select a horizontal diameter *Dr* that was greater than or equal to 10 m. in the apparatus of Kolbel et al., on the basis of suitability for the intended use thereof, because changes in size merely involves routine skill in the art, and it has been held that where the general conditions of a claim are disclosed in the prior art, discovering the optimum or workable ranges involves only routine skill in the art, *In re Aller, 105 USPQ 233.*

Regarding claims 27 and 28, Kolbel discloses that, "[w]hen the pipes [7] are conducted through the inside of the shafts [4], the distance between each pipe and between the pipe and the inside wall of the shaft should not be less than 3 cm." (column 5, lines 28-31). In addition, Kolbel discloses that, "[t]he diameter of the shafts [4] should be at least 5 cm. and can amount to

30 cm. or more. It conforms to the height and to the cross section of the pipes [7] installed in the shafts [4] for heat exchange." (column 4, lines 31-34). Although Kolbel is silent as to the characteristic size *Ds* being between about 0.15 meter and about 0.5 meter, or between about 0.15 meter and about 0.5 meter, it would have been obvious for one of ordinary skill in the art at the time the invention was made to select a suitable *Ds*, such as one of the instantly claimed ranges of *Ds*, in the apparatus of Kolbel et al., on the basis of suitability for the intended use, because changes in size merely involves routine skill in the art, and it has been held that where the general conditions of a claim are disclosed in the prior art, discovering the optimum or workable ranges involves only routine skill in the art, *In re Aller, 105 USPQ 233.*

Regarding claims 32 and 33, Kolbel discloses that, "[w]hen the pipes [7] are conducted through the inside of the shafts [4], the distance between each pipe and between the pipe and the inside wall of the shaft should not be less than 3 cm." (column 5, lines 28-31). Although Kolbel is silent as to the spacing *Di* between centers of adjacent internal structures **4** and **7** being between about 1.1*d* and about 4*d*, or between about 1.2*d* and about 3*d*, where d is a characteristic size of each of the plurality of internal structures **4** and **7**, it would have been obvious for one of ordinary skill in the art at the time the invention was made to select a suitable *Di*, such as one of the instantly claimed ranged of *Di*, in the apparatus of Kolbel et al., on the basis of suitability for the intended use, because changes in size merely involves routine skill in the art, and it has been held that where the general conditions of a claim are disclosed in the prior art, discovering the optimum or workable ranges involves only routine skill in the art, *In re Aller, 105 USPQ 233.*

Regarding claims 35 and 36, Kolbel discloses that, "[w]hen the pipes [7] are conducted through the inside of the shafts [4], the distance between each pipe and between the pipe and the

inside wall of the shaft should not be less than 3 cm." (column 5, lines 28-31). In addition, Kolbel discloses that, "[t]he diameter of the shafts [**4**] should be at least 5 cm. and can amount to 30 cm. or more. It conforms to the height and to the cross section of the pipes [**7**] installed in the shafts for heat exchange." (column 4, lines 31-34). Although Kolbel is silent as to the specific characteristic size *d* for each of the plurality of internal structures **4** and **7**, it would have been obvious for one of ordinary skill in the art at the time the invention was made to select a suitable characteristic size *d*, such as a characteristic size d within one of the instantly claimed ranges, in the apparatus of Kolbel et al., on the basis of suitability for the intended use thereof, because changes in size merely involves routine skill in the art, and it has been held that where the general conditions of a claim are disclosed in the prior art, discovering the optimum or workable ranges involves only routine skill in the art, *In re Aller, 105 USPQ 233.*

Regarding claims 51, 52, 59-61 and 64, Kolbel is silent as to structures **4,7** comprising an area of about 10% to about 25%, or about 15% to about 25%, or about 15% to about 20%, or about 5% to about 20%, of the cross-sectional area of the reaction vessel **1**. In any event, it would have been obvious for one of ordinary skill in the art at the time the invention was made to select an appropriate area for the internal structures **4** and **7** relative to the cross sectional area of the reaction vessel **1** in the apparatus of Kolbel et al., on the basis of suitability for the intended use thereof, because changes in size merely involves routine skill in the art, and it has been held that where the general conditions of a claim are disclosed in the prior art, discovering the optimum or workable ranges involves only routine skill in the art, *In re Aller, 105 USPQ 233.*

10. Claims 19, 20-26, 29, 37-46, 48-50, 53-58, 62, 63, 65, 68 and 69 are rejected under 35 U.S.C. 103(a) as being unpatentable over Garbo (US 2,539,415).

Regarding claims 19, 23-26, 48-50, 53, 54, 62 and 63, Garbo (FIG. 1, 2; column 3, line 60 to column 4, line 74) discloses an apparatus comprising: a reaction vessel (i.e., defined by cylindrical shell **10**); a gas distributor (i.e., inlet pipe **13**) disposed near the bottom of the reaction vessel **10**; and a plurality of internal structures (i.e., cooling tubes **23**, supply tubes **16**) disposed within the reaction vessel **10**, wherein the structures **23** and **16** are arranged so as to create a plurality of reaction zones in the reaction vessel (i.e., as defined by the spaces between structures **23** and **16**; see FIG. 2), wherein each reaction zone is in fluid communication with at least one adjacent reaction zone; and wherein the plurality of internal structures **23** and **16** is configured such that each of the reaction zones has a characteristic size *Ds* that is less than the reaction vessel internal diameter *Dr* (see FIG. 2). As can be seen in FIG. 2, the reactor vessel **10** comprises a non-uniform distribution of internal structures **16** and **23**. Although Garbo is silent as to the specific internal diameter *Dr* for the reaction vessel **10**, it would have been obvious for one of ordinary skill in the art at the time the invention was made to select a suitable internal diameter *Dr* for the reaction vessel **10**, such as one of the instantly recited ranges of *Dr*, in the apparatus of Garbo, on the basis of suitability for the intended use thereof (e.g., for a given reactor capacity), because the Examiner takes Official Notice that changes in size merely involves routine skill in the art.

Regarding claims 20-22 and 56, the apparatus comprises a patterned arrangement of structures **23** and **16** (FIG. 2), creating reaction zones of circular, rectangular, diamond, concentric circular and a combination shapes, and further creating repeating zones.

Regarding claim 29, as can be seen in FIG. 1, the ratio of the height to the diameter of the reaction vessel **10** appears to be about 2.

Regarding claim 37, structures **23** and **16** comprise components having permeable walls (i.e., supply tubes **16** may comprise apertures **18**, FIG. 1, or a porous tube **38**, FIG. 3, 4).

Regarding claim 38, the reaction vessel **10** includes a solid phase (i.e., a fluidized catalyst **12**) retained outside the walls of supply tubes **16** during operation (i.e., between the outer wall of supply tubes **16** and the inner wall of reactor **10**; FIG. 2).

Regarding claim 39, reaction vessel **10** includes a solid phase retained inside the walls of tubes **16** during operation (i.e., within the circle defined by the ring of supply tubes **16**; FIG. 2).

Regarding claims 40 and 55, the internal structure **16** and **23** are parallel so as to create repeating parallel reaction zones (see FIG. 2).

Regarding claims 41 and 42, the internal structures **16** and **23** include tubes or rods with a circular cross-sectional shape (see FIG. 2).

Regarding claims 43, 57 and 58, the structures include cooling tubes **23** comprising a continuous set of vertical tubes connected by a connection means (i.e., tube sheets **20** and **21**).

Regarding claim 44, the reactor **10** comprises tubular structures inherently permeable to gas and liquid (i.e., supply tubes **16** with apertures **18**, FIG. 1, or a porous tube **38**, FIG. 3, 4).

Regarding claims 45 and 46, the apparatus of Garbo structurally meets the claims because the use of the apparatus as a "hydrocarbon synthesis reactor" or a "slurry bubble column" is considered an intended use that provides no further patentable weight to the claims.

Regarding claim 65, the reaction vessel **10** comprises at least 2 distinct circular reaction zones (see FIG. 2).

Regarding claim 68, the apparatus of Garbo structurally meets the claims because the gas flow linear velocity is considered a process limitation that provides no further patentable weight

to the apparatus claim.

Regarding claim 69, the apparatus of Garbo structurally meets the claims; therefore, as best understood, a reaction conducted within the apparatus of Garbo would inherently exhibit the recited hydrodynamic behavior.

Conclusion

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Jennifer A. Leung whose telephone number is (571) 272-1449. The examiner can normally be reached on 8:30 am - 5:30 pm M-F, every other Friday off.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Glenn A. Caldarola can be reached on (571) 272-1444. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

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Jennifer A. Leung
November 17, 2005

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PRIMARY EXAMINER